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MECHANICAL AIDS TO FLIGHT.

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Airplane pilots as a class are men of highly individualistic nature. They are, as a whole, disposed to base their opinions on their own experiences and to defend those opinions in an extremely contentious fashion. Of all the points on which arguments can readily be started in aeronautical circles, however, there is hardly one on which the differences of opinion are more marked than in respect of the wisdom of depending on instruments when flying.

The airplane pilot trained during the war is likely to regard all instruments with great contempt and to consider their use a confession of weakness and incompetence. It is not unnatural that that should be his view, for the exactions of military flying gave little opportunity for the use of instruments, even had they been available in satisfactory types and quantities. The coming of peace and commercial aviation has put a very different face on the situation, and many pilots even of great skill are now coming to think very highly of instrumental aid in their flying and to depend largely upon it. Mechanical assistance by the use of instruments is especially desirable in airplanes where the pilot sits behind windows inside a cabin and where, therefore, he cannot depend on "the feel of the wind on his face."

The instruments available are many and they may be grouped

* Taken from "The Christian Science Monitor."

in general into 2 classes: those designed to tell how the airplane is performing and those intended to tell where it is. Of the first class, the most notable and that most universally employed is the tachometer or engine speed indicator, a device without which one would hardly venture to fly even under military conditions. Of navigating instruments or those used partially for navigating, there are a great many. The commonest, and the ones which are familiar to every student of flying, are the air-speed indicator and the altimeter for recording the height above sea level. For making cross-country flights under conditions of fog and storm, however, much more elaborate equipment is required, and the instrument board of a three-engined airplane prepared for a long flight may hold as many as thirty dials of various sorts.

Keeping Right Side Up.

The first of the special instruments produced during the war was a turn indicator, showing whether or not the airplane is holding a straight course. It is a surprising fact that the pilot cannot tell by his own bodily sensation when among clouds or fog whether he is flying straight and on an even keel or whether he is traveling in a circle with the airplane tilted far out of the level. It will be remembered that Sir John Alcock and Sir Arthur Brown, on their remarkable flight from Newfoundland to County Galway, at times departed very badly from the position of equilibrium and did not realize their abnormal ~~altit~~ altitude until they came out of the clouds and could again see the ocean and the horizon. The

indicator, particularly when used in combination with another instrument for giving the angle of tilt, shows the pilot at once how accurately he is holding a straight course.

It might be supposed that the functions assigned to the turn indicator could be performed satisfactorily by a compass, but the airplane compass has often proved a feeble reed to lean upon in times of stress, as it fails to tell the truth except when the airplane is approximately horizontal and flying in a straight line. The magnetic compass is also subject to disturbance by the influence of the numerous iron and steel parts of an airplane, and other types of compass free from magnetic influence have therefore been developed to overcome this effect. The gyroscopic compass, for example, such as is used in battleships, has been provisionally applied to aircraft on a small scale, and a still more promising development in the same direction is the earth inductor compass, which is electrical rather than magnetic and which has recently been produced by the Bureau of Standards.

In addition to the instruments mounted on the board in front of the pilot there are, of course, certain other tools of the navigator whose use the airplane pilot has in common with the voyager at sea. Most venerable among these devices and most familiar to any one who has watched the operation of "shooting the sun" is the sextant. The sextant finds service while navigating through the air as well as over the surface of the water, but it must be a special type, as it is seldom possible to see a horizon when fly-

ing at great heights, owing to haze. It is, therefore, only within the last few months that the sextant has been made a practical tool for the air navigator by the development of a special type known as a bubble sextant, in which a level is contained within the instrument itself and which accordingly requires no sighting of the horizon but only a glimpse of the sun.

The Aviator's Unfilled Wants.

The instrument designer has displayed great ingenuity, but there remains much yet to be done. The most important of all instruments to the aircraft navigator are yet to be invented or at least to be reduced to practical form. Among the unfilled wants the most important are a ground speed indicator for determining the actual direction and rate of movement over the surface of the earth and an indicator of true altitude. It is easy to measure speed through the air, but there is no way now known of finding the speed over the ground and the effect of the wind which drives the airplane backward drifts it to one side except by observing the motion of objects on the earth. Similarly, while the altimeter gives the height above sea level with accuracy it does not give the actual height above the ground, and there is great danger in cross-country flying of crashing into the side of a mountain whose presence the pilot did not suspect and which was hidden by fog. Many of the problems of navigation on a fixed route can be taken care of by the use of directional wireless and such electrical route indicators as that of M. Loth, but it is none the

less desirable to have instruments which will make the airplane self-contained and independent of aid from the ground.

It would be ungrateful for any writer on aeronautics to omit at the present time pausing to offer a word of tribute to Mr. E. H. Shaughnessy, Second Assistant Postmaster-General. Mr. Shaughnessy's position had put him in charge of the operation of the air mail service, and what his interest and energy had meant to that service can only be appreciated by those who have been in a position to become thoroughly familiar with the extraordinary record that it has made during the last year. Mr. Shaughnessy was a confirmed friend of aeronautics and an advocate of the extension of the commercial use of aircraft and in the last few weeks had been twice before congressional committees to plead for fairer treatment and more effective legislation leading to the encouragement of postal and other commercial flying.

It is becoming a commonplace to see that the airplane has succeeded where other means of transportation have failed. Within the past few weeks we have heard the story of how airplanes proved the sole reliance of communication between France and Southern Africa when cable and wireless communications were interrupted immediately following a storm, and how many hundreds of messages desired for transmission over the cables had to be carried on the craft of the Lignes Latécoère, operating tri-weekly from Toulouse to Casablanca.

It must, nevertheless, come as a surprise to some Americans to learn that the air mail is not only competing with but excelling

in performance some of the oldest and most efficient of railroads. Mr. Leon B. Lent, formerly in charge of the technical side of the operation of the air mail service, pointed out in a recent communication to the American Society of Mechanical Engineers that during last summer the percentage of perfect on-time performance for the transcontinental air mail was 96, while during a similar period one of the greatest of the eastern railroads pointed with pride on its folders to the fact that 995.6 per cent of its trains had arrived on time. The air mail is accomplishing marvels, but judging from the general public ignorance of its work the arrangements for giving publicity to that work must be very weak.

